88-2 5247

FRANKLIN INSTITUTE

THE THEORY OF

FIRE-PROOF CONSTRUCTION

AS

APPLIED TO WOOD JOIST.

BY JAMES JOHN.

CHICAGO:
PRINTED BY THE WABASH PRINTING COMPANY,
138 AND 140 LAKE STREET.

MDCCCLXXIV.

THE THEORY OF

FIRE-PROOF CONSTRUCTION

AS

APPLIED TO WOOD JOIST.

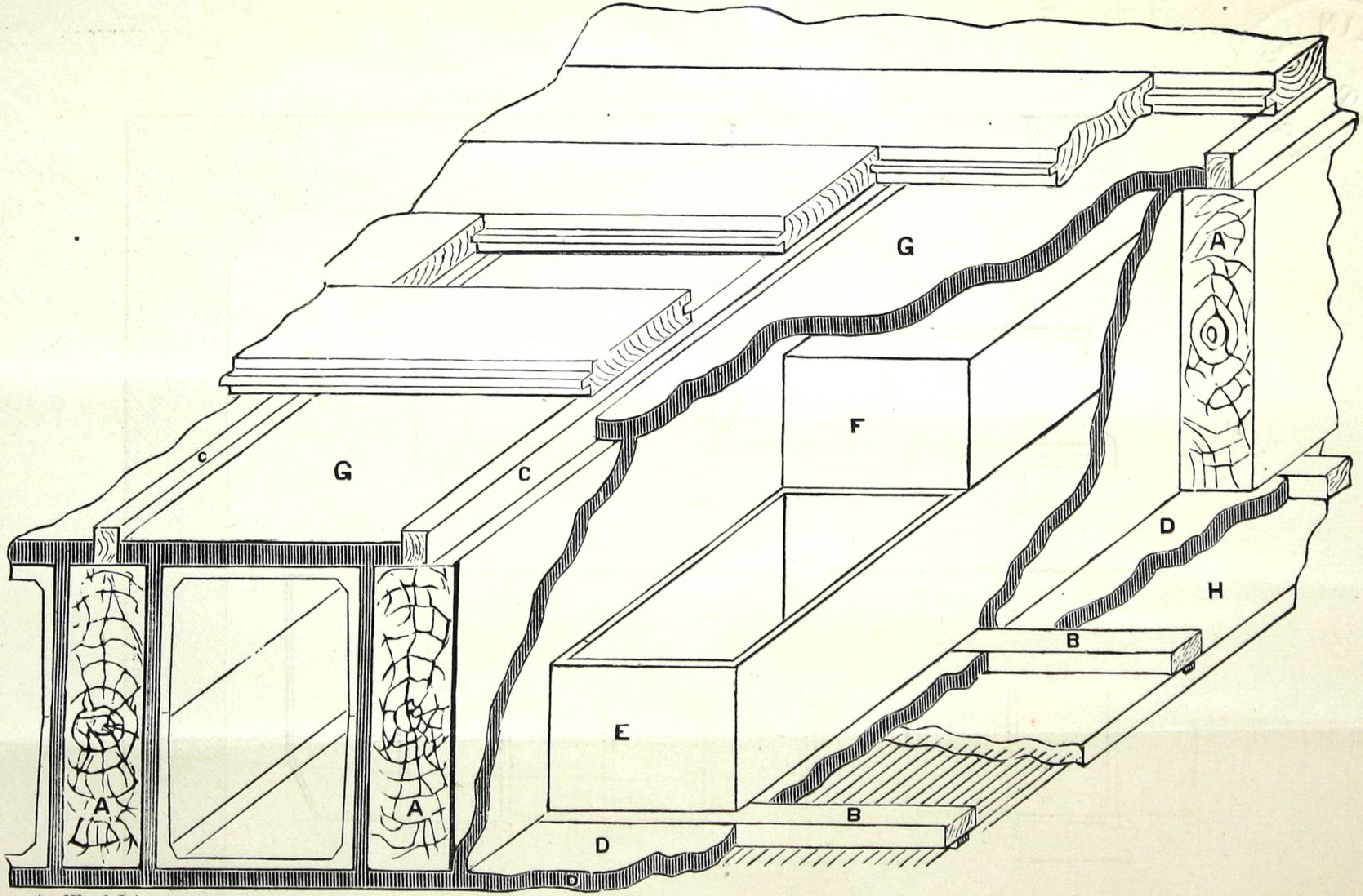
BY JAMES JOHN.

CHICAGO:
PRINTED BY THE WABASH PRINTING COMPANY,
138 AND 140 LAKE STREET.

MDCCCLXXIV.

Entered according to the Act of Congress, in the year of our Lord 1874, by
JAMES JOHN,
In the Office of the Librarian at Washington.

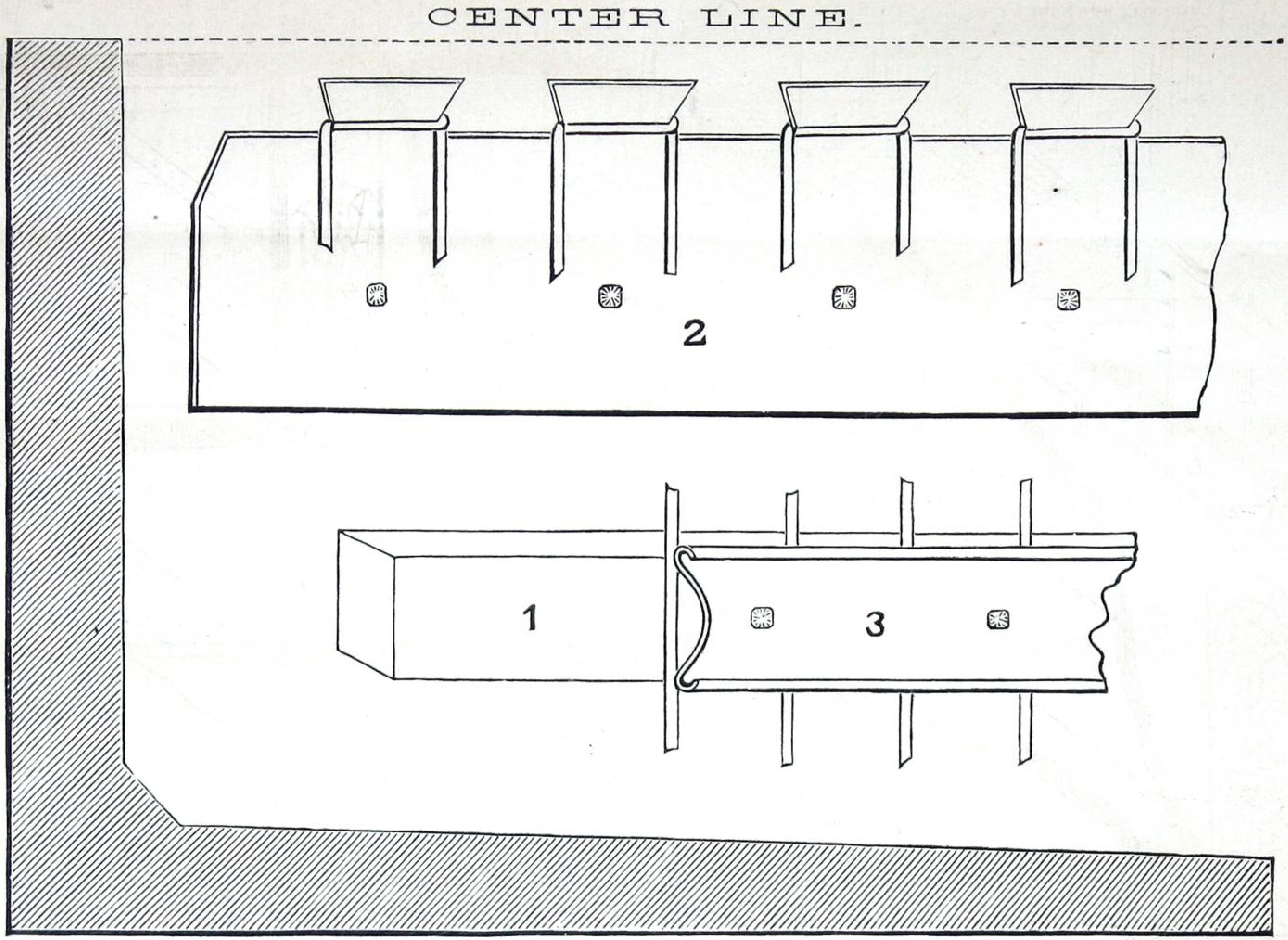
FRANKLIN INSTITUTE



A—Wood Joist.
B—Furring.
C—Deafening Strip

D—Concrete Filling.
E—Hollow Box of Plaster (2 feet long).
F—Hollow Box of Plaster (inverted).

G—Concrete.
H—Wire Lathing and Plastering.



Section of half of Plaster Box, Full Size.

FIRE-PROOF CONSTRUCTION AS APPLIED TO WOOD JOIST.

THE foregoing drawings, and explanatory notes thereto, are intended to explain a method of fire-proof construction, as applied to wood joist, the want of which, I claim, has long been felt; and we certainly have had admonitions enough, that in the future we should, at least endeavor to, build with a view of being more secure against a recurrence of large fires. The inventor of the plan here proposed has had twenty-five years experience in the building line; was an eye-witness of, and sufferer, by Chicago's great fire of 1871, and has seen the devastation wrought by Boston's two great fires of more recent date. Couple with these those of Baltimore, Portland, and minor places that have been almost swept out of existence during the last two years, and it certainly affords food for serious reflection. This wholesale destruction of property (Chicago and Boston's great fires alone being over three hundred millions) and loss of human life occasioned thereby have caused me, among the universal clamor for a better system of building, to do my share of thinking and devising means of accomplishing the desired end, namely: a system of *cheap* fire-proof—something that would not admit of a seventy-five or one hundred thousand-dollar building being reduced to ashes, together with its contents, inside of twenty minutes after taking fire. There have been instances of this aside from our great fire. In common with many others, I had always thought (prior to the experience of the last two years) that a building constructed exclusively of iron and brick could not burn, but have formed very different opinions of late; have had an opportunity of hearing some of the most talented architects in the United States express themselves on the subject of a better method of constructing floors in buildings for the purpose of more successfully resisting fire. Iron was always taken up by every one—as that was the only thing called *fire-proof* offered—but each in turn would admit that there was really no great security to it in case of fire, especially if there was any more combustible material to be consumed than ordinary office furniture, the consumption of which, by fire, would produce heat sufficient to expand iron beams to such an extent that they either let the arches between them drop out, or, in some cases, push the walls over.

The conclusions arrived at by each and every one was, that if there was any method of PROTECTING WOOD JOIST so that a fire, if not checked in its incipient stage, would at least be retarded in its progress, it would be a much better plan than to try and build a building absolutely fire-proof. I claim that a floor of wood joist, protected as here proposed, cannot burn any more than the wood blocks in a paved street, and the top edge of those merely charred in Chicago's great fire. Further, the Republic Life Insurance building, in this city, had wood joists; was plastered on wire; had a heavy deafening on top, with a composition tile floor. This building had several sections of wood joist left after our great fire, and was subject to the most intense heat. That an iron construction *is not fire-proof*, take for instance Chicago's postoffice in our great fire, the construction of which was iron beams with brick arches between, and, to a great extent, tile floors, iron stair cases, iron shutters, etc. Not a vestige of floor in this building was left in position, and certainly the government work was performed in as good and substantial manner as any individual could expect to have it done, so the fault should not lie in that direction. Other instances: the *Tribune* building, with iron beams and corrugated iron arches, was almost a wreck; one-third of the First National Bank, constructed as the *Tribune* building (probably the best built private building in the West), succumbed. The Court House had a variety of construction; in connection with iron beams a portion of the east wing, in which was corrugated iron arches, was about all that was left of that.

From the sad experience of the United States during the past two years, a recapitulation of fires and instances is not necessary to impress upon the reader the importance of building cities of something better than common wood construction. Take the enormous cost and weight of iron, and at best few can afford to use it, together with its inability to stand any fire to speak of. It is thought, even should there be nothing else offered, the number of *so called fire-proof buildings* would be more rare in the future than the past.

As stated in the commencement, the main object of these remarks is to make the method here proposed correctly understood; for example, I will take a given dimension of timbers say 3x12-inch joist (Letter **A**), placed in position 12 inches from centers, tack some strips transversely on top of joist to hold them in position until furring strips are nailed on underneath, as in ordinary lengths of joist bridging can be dispensed with, as the filling between joists forms a continuous bridge from one end of the joist to the other. Furring should be ⅞ x 2 or 1 x 2 inches (Letter **B**), placed 12 inches from centers and *well nailed to every joist.* When done remove the temporary transverse strips and nail on strips (Letter **C**) 1 inch wide by 1½ inches deep. I then propose to take thin rough boards, and either tack them with nails or support them by props to the underside of the furring, then commence work by filling in between the furring (Letter **D**), taking care to slush well under the joist, and to strike the same off even with the top surface of the furring. This material to consist of a coarse hair mortar gauged with sufficient plaster or cement to set the same. The next thing in order is to place the bottom row of empty boxes in position (Letter **E**), which are cemented by plaster or cement to the concrete (Letter **D**) between the furring; this being done, put in the top row of boxes (Letter **F**) inverted, breaking joints as in laying brick, cementing the same on the edges to the lower course of boxes. These boxes are cast, and consist of plaster, sand and a little hair, as used in mortar. The outside dimensions are 1¼ inches less in width than the space between the joist, and being placed in the center of the same, leaves a crevice of ⅝ inch on either side, in which I propose to run a liquid concrete until full to the top of the boxes, which is even with the top surface of the joist—this concrete to consist of lime mortar, cement or plaster and screened ashes or cinders. Then take a coarser material, composed about as above, and put on one inch thick on the top of the boxes, striking the same off to an even surface. This now leaves one-half an inch to the top of the strips on the joists to which the floor is nailed. This completes the filling-in process.

I presume it would be almost superfluous to say anything in regard to concrete withstanding heat; every architect and mechanic must admit there is no substance—neither iron, stone nor marble—that is as desirable to have in a building in case of fire as concrete.

The floors in Paris, of which we have heard so much in regard to their fire-proof qualities, consist of wood joist with the entire space between same being filled solid with plaster, some of which are known to be two hundred years old. The plan here proposed is far more economical, and much lighter.

This method of filling-in between joists I patented December 2, 1873. (No. 145,211.)

I will superintend this construction in a building of sufficient magnitude to make it an object in almost any city in the Union, or will enter into mutually satisfactory arrangements with any resident mechanic for its use that desires to undertake its construction, to whom I would be pleased to answer any inquiry he may see fit to make.

We now have the ceiling below this floor so treated, to plaster. It will be remembered the space between the furring is filled so that the ceiling has a back ground, or surface, similar to a plastered ceiling. I now propose to lath this with No. 19 annealed wire, in the following manner: First, nail on the surface of the furring a wood strip ½ inch wide by ¼ inch thick (Fig. 1)—except the furring next to the wall, on this one nail the sheet iron strip (Fig. 2)—then stretch the wire from one side to the other in a continuous length, making each strand fast to the iron strip (Fig. 2) by a half hitch, then nail on with coarse three-penny nails the sheet iron strip (Fig. 3) to secure the wires to every furring. The usual distance these strands of wire are apart is half an inch—this is when it was applied in the absence of the background—in which case the mortar was gauged with plaster, and was then easily applied (applies also to a vertical surface). In this case, for the purpose of making it as inexpensive as possible, the wires may be from two to three inches apart, as their only object in this case would be to hold the plastering in position in case of any expansion that might take place in the event of fire. The plastering should be as follows: The first coat of good hair mortar (need not be gauged), thoroughly scratched, *when dry*, apply the second coat as thin as consistent to make an even surface, and then, at the proper time, to apply sand finish or hard finish, as the case may be.

This method of plastering on parallel strands of wire, as herein set forth, I patented October 3, 1871 (No. 119,615), and it has been used to a great extent, in Chicago, on some of the best buildings erected before and since the fire. I will instance a few: the ceiling of the Board of Trade, in the Chamber of Commerce, containing about 1,400 yards in the one ceiling.

In reply to a request I made of the President of the Chamber of Commerce for an expression of his views as to its merits, I received the following:

"CHAMBER OF COMMERCE OF THE CITY OF CHICAGO,
"July 23, 1873.

"*To whom it may Concern:*

"MR. JAMES JOHN put his patent wire lath on the Board of Trade room, in the Chamber of Commerce, last year. A committee was appointed to thoroughly test its merits, and after a full examination came to the conclusion that it was much the best lath presented, and so far it has fully answered our expectations.

(Signed) DANIEL A. JONES,
"*President of the Chamber of Commerce.*"

The Singer Manufacturing Company's building, corner of State and Washington streets (costing $600,000), occupied by Messrs. Field, Leiter & Co. as a dry goods store, the first, second and third story ceilings were plastered on this wire lathing, the object in this case being to guard against the plastering falling, from the constant vibration of the floors caused by the motion of hundreds of people and the handling of merchandise. It will be remembered that just before the completion of this building, about 5 o'clock in the evening, it took fire in the roof (from a charcoal furnace used by roofers), and on account of its great height, and the difficulty of getting hose up, the fire had spread over, and finally damaged, the entire roof. On account of being unable to determine the exact location of the fire an immense quantity of water was thrown into the building. The ceilings of the three upper stories were lathed and plastered on wood lath, in the usual manner; the water went through these floors and ceilings in a short time, but when it came to the top ceiling that was plastered on wire the water could not, or did not, go any further.

Mr. E. S. Jennison, architect of this building, claims that at 2 o'clock on the following morning, when looking over the building to ascertain to what extent the lower stories were damaged, his curiosity was excited at the non-appearance of water on the third story; seeing a damp spot on the ceiling he made a hole in the plastering, and the water came pouring down as from an engine hose. He claims that in some portions of the building the entire space between the plastering and the floor (the depth of the joists) was filled with water, and all that was done to these ceilings so perforated to let the water off, was merely to fill the holes. The entire plastering on wood lath had to be taken off and replastered. The foregoing is vouched for also by John W. Roberts, architect, of this city. This wire plastering cost about ninety cents per yard, which figure prevented its use on the three upper stories. Had this building been filled with goods, as at the present time, the plastering on these three stories alone would have saved hundreds of thousands of dollars worth of goods from being rendered worthless by water.

Further, the main dining-room, ladies' ordinary and kitchen department of the Pacific Hotel, the three extending the entire block (from Clark to LaSalle streets), 325 feet, is plastered on wire, being used in the dining-rooms as a safe-guard against cracking (being very highly frescoed), and in the kitchen department as a fire-proof.

Also, the Academy of Science building; N. Matson's jewelry store, corner of State and Monroe streets; A. H. Miller's jewelry store; Heath & Milligan's store; McCormick's Hall, and numerous other places.

I estimate the cost of filling between joists and plastering on wire, three coats, as specified, at twenty five cents per superficial foot, or $2.25 per yard, to measure in one-half of all ordinary openings, such as stairs, hatchways, etc.; in lieu thereof, to lath with wire ½ inch apart the face of all header and trimmer joists surrounding the same, and plaster one heavy coat of mortar to protect them in case of fire and the facia burning off. The weight of filling and concrete is about twenty pounds to the foot, when dry.

I claim floors so constructed will admit of a stock of combustible merchandise being consumed by fire, and the building be left standing.

Note.—I would like any interested resident parties to call and examine a sample, full size, at my office, 457 Wabash avenue.

JAMES JOHN.

I refer to Messrs. W. W. Boyington, John W. Roberts, W. L. B. Jenney, Architects, or any of the leading architects of Chicago.

THE LARGEST, MOST COMPLETE AND BEST SELECTED STOCK OF

MODERN DESIGNS OF CENTER PIECES

WEST OF NEW YORK.

ARCHITECTS' DESIGNS SKILLFULLY EXECUTED.